Fig.1

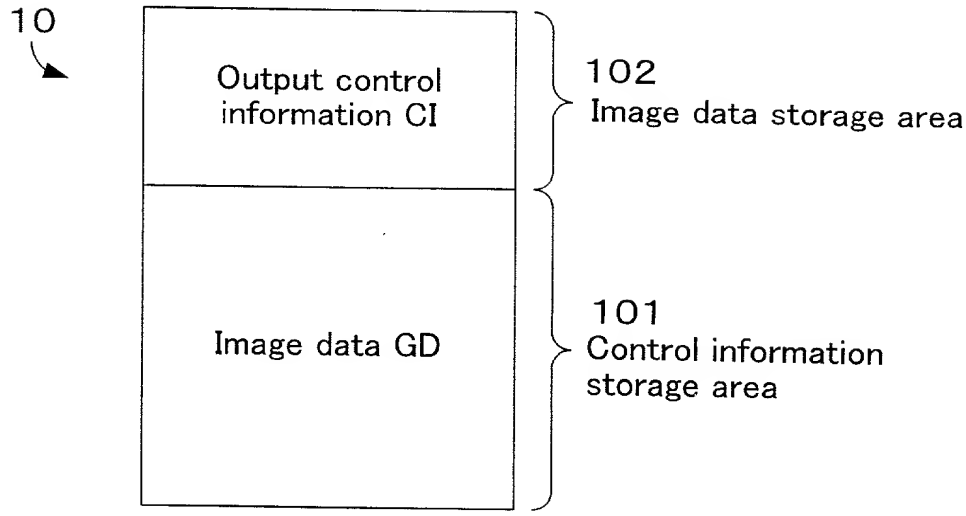
10
Output control information CI
Image data GD
102
Image data storage area
101
Control information storage area

Fig.2

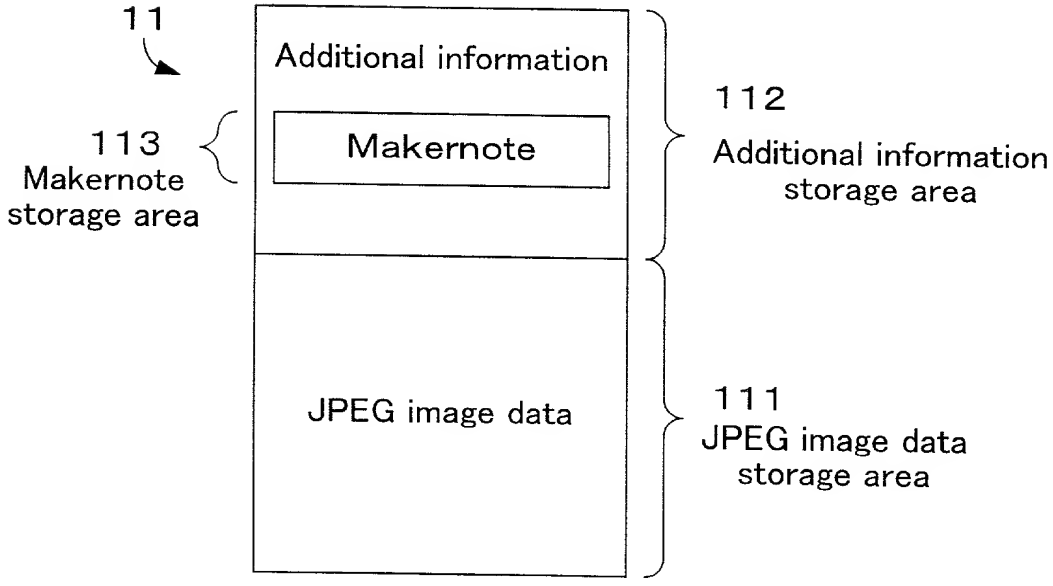
11
Additional information
Makernote
113
Makernote storage area
112
Additional information storage area
JPEG image data
111
JPEG image data storage area

Fig.3a

114

Offset	Meaning of Information
0	Maker name 00x0
6	reserve
8	Local tag entry count
10	Local tag 1
22	PrintMatching
–	–
10+12*(N-1)	Local tag N

113
Makernote data storage area

Fig.3b

Offset	Meaning of Information
0	PrintMatching identifier
8	PIM Version information
12	Reserve
14	Parameter specification count
16	First parameter number
18	First parameter setting value
22	Second parameter number
24	Second parameter setting value
28	Third parameter number
30	Third parameter setting value
–	–
n-2	nth parameter setting value
n	nth parameter number

114
PrintMatching data storage area

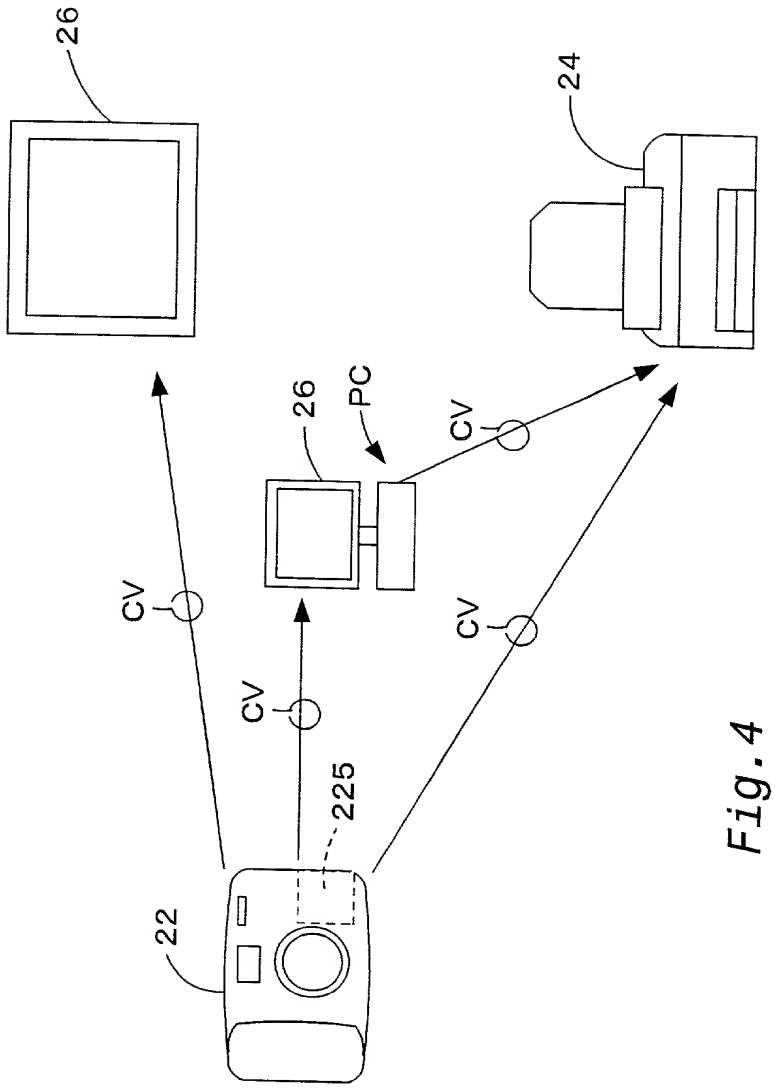

Fig. 4

Fig.5

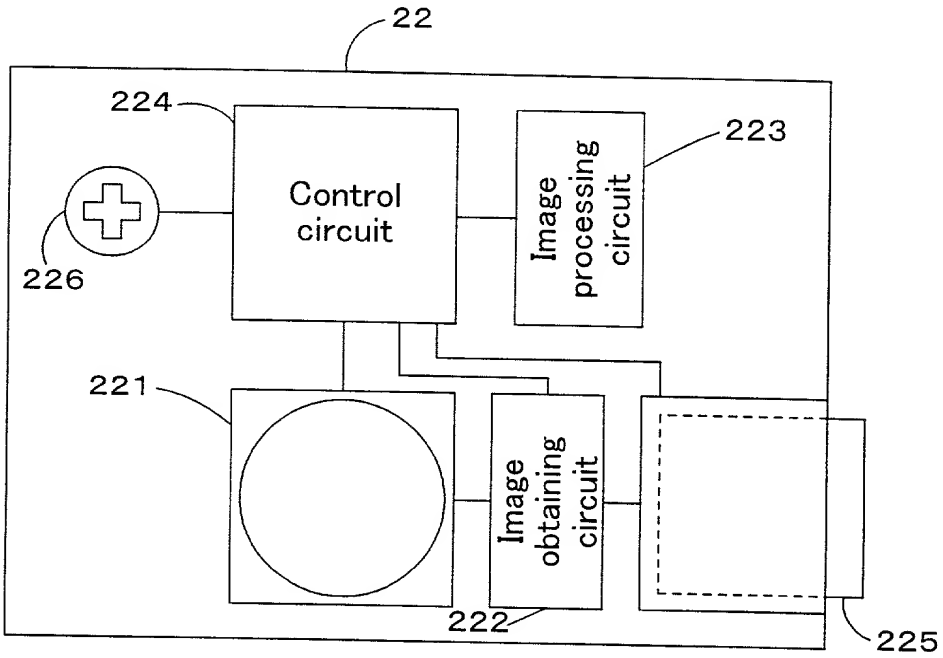
22
224
Control circuit
223
Image processing circuit
226
221
Image obtaining circuit
222
225

Fig.6

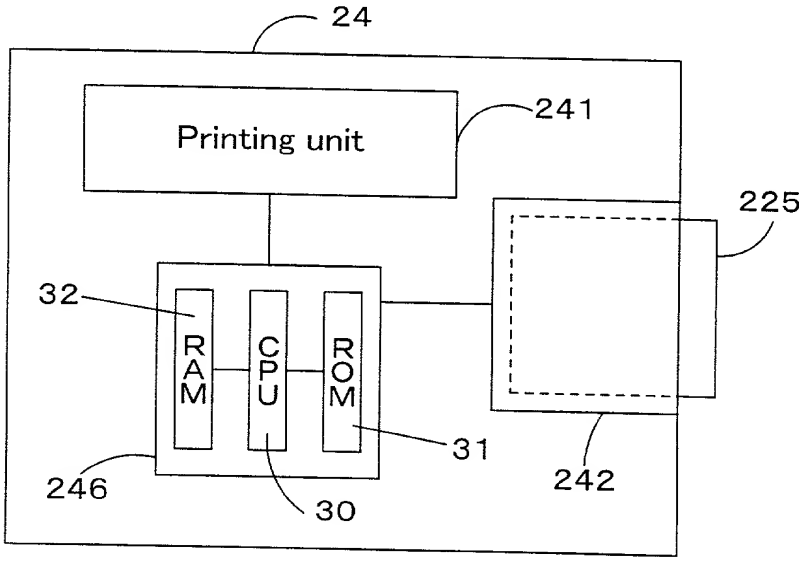
24
Printing unit
241
225
32
RAM
CPU
ROM
31
246
30
242

Fig.7

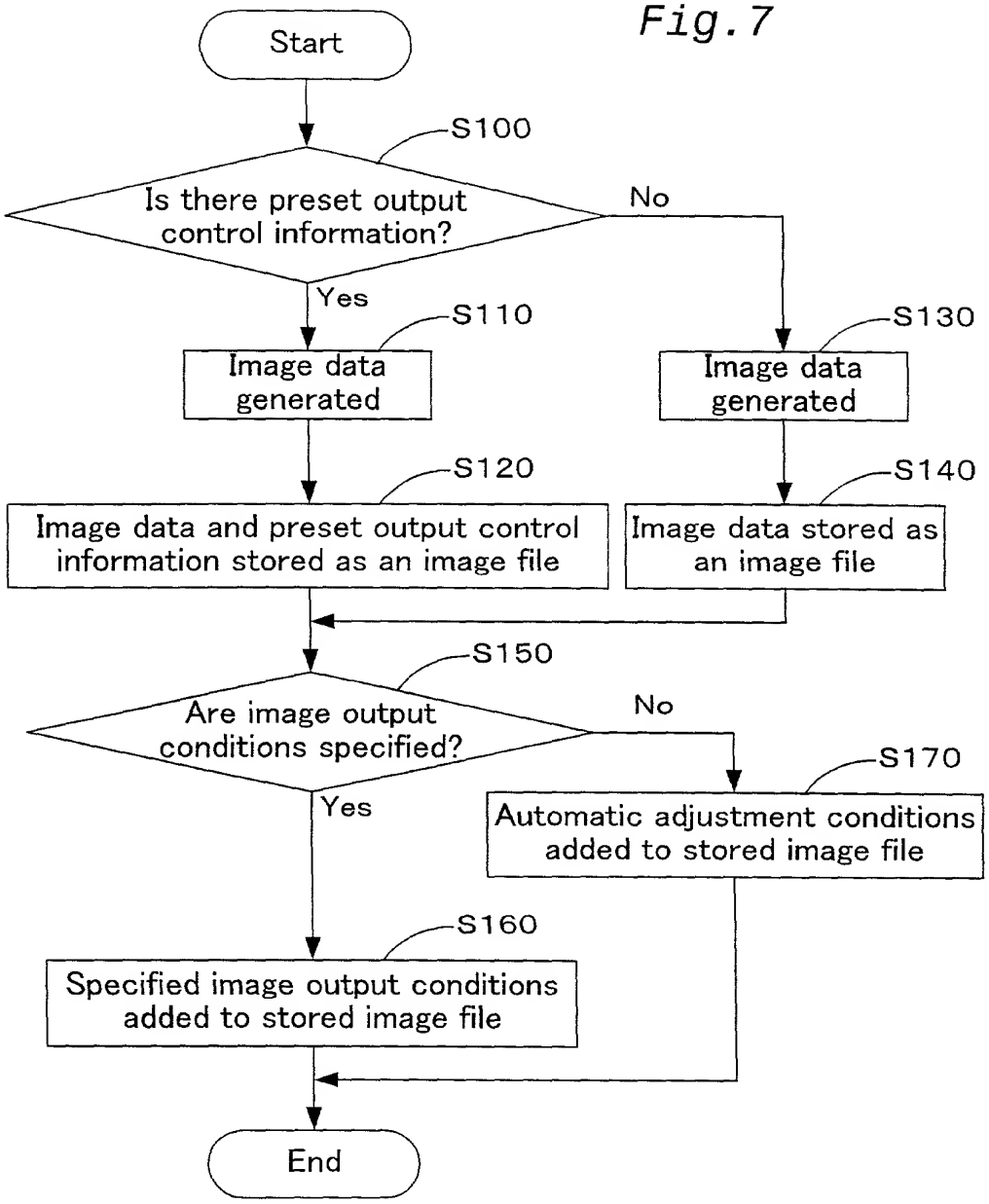
Start
S100
Is there preset output control information?
No
Yes
S110
Image data generated
S130
Image data generated
S120
Image data and preset output control information stored as an image file
S140
Image data stored as an image file
S150
Are image output conditions specified?
No
Yes
S170
Automatic adjustment conditions added to stored image file
S160
Specified image output conditions added to stored image file
End

Fig.8

Control Parameters	Specified Value
Gamma value	2. 2
Target color space	NTSC
sRGB negative value processing	1 (valid)
Shadow	5
Highlight	2
Contrast	0
Brightness	4
RGB color balance	R0/G-1/B2
Saturation	0
Sharpness	Threshold value 2 Applied volume 3
Stored color correction	Green 0, 0, 0 (unspecified), Light blue 0, 0, 0 (unspecified) Flesh 0, 0, 0 (unspecified), Red 0, 0, 0 (unspecified)
Automatic adjustment	5
Paper	3 (photographic paper)
Resolution	4 (photograph)
Bi-directional printing	1 (on)

0934.7.1.60200.1

Fig.9

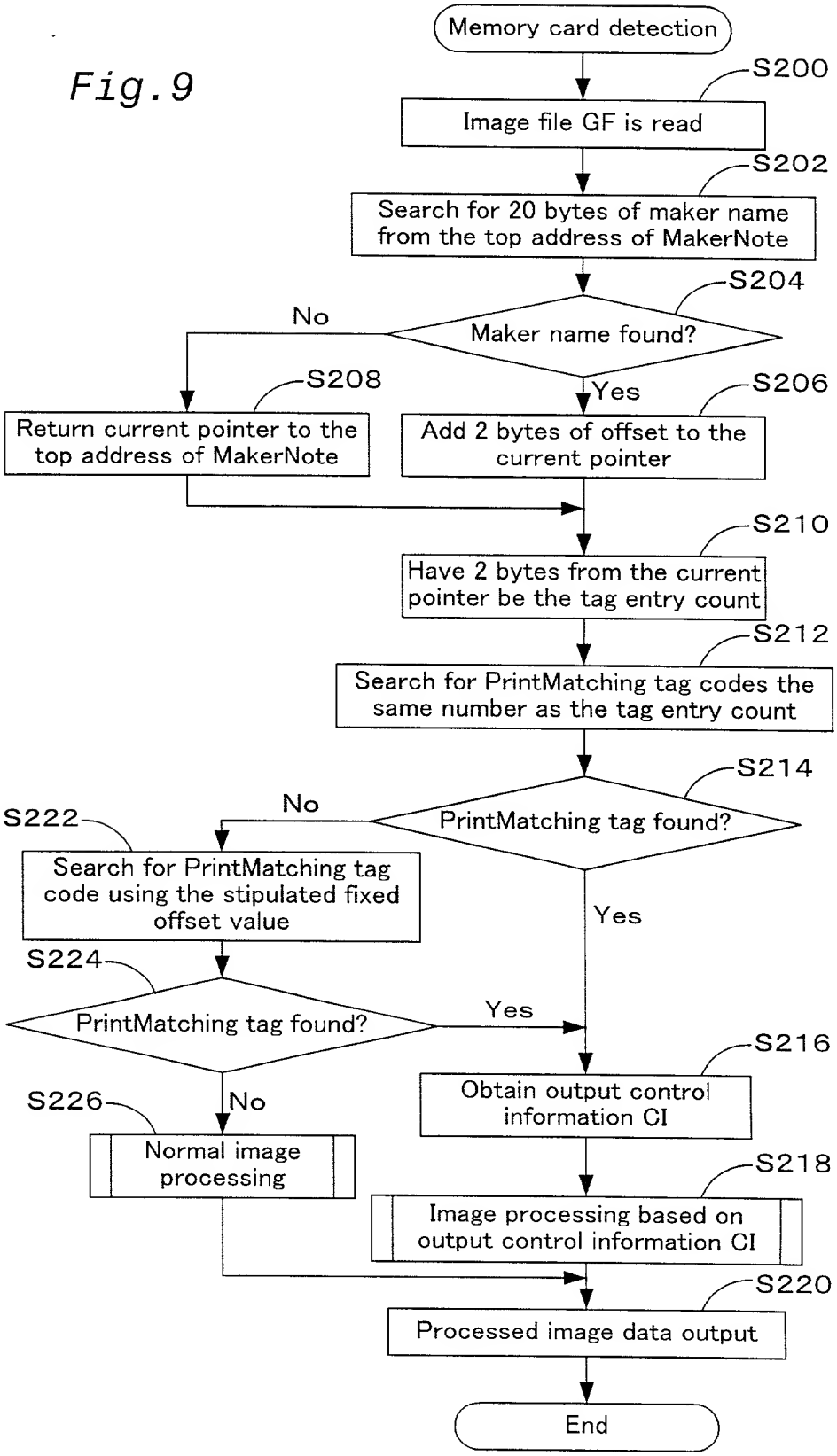
Memory card detection
S200
Image file GF is read
S202
Search for 20 bytes of maker name from the top address of MakerNote
S204
Maker name found?
No
Yes
S208
Return current pointer to the top address of MakerNote
S206
Add 2 bytes of offset to the current pointer
S210
Have 2 bytes from the current pointer be the tag entry count
S212
Search for PrintMatching tag codes the same number as the tag entry count
S214
PrintMatching tag found?
No
Yes
S222
Search for PrintMatching tag code using the stipulated fixed offset value
S224
PrintMatching tag found?
Yes
No
S226
Normal image processing
S216
Obtain output control information CI
S218
Image processing based on output control information CI
S220
Processed image data output
End

Fig. 10

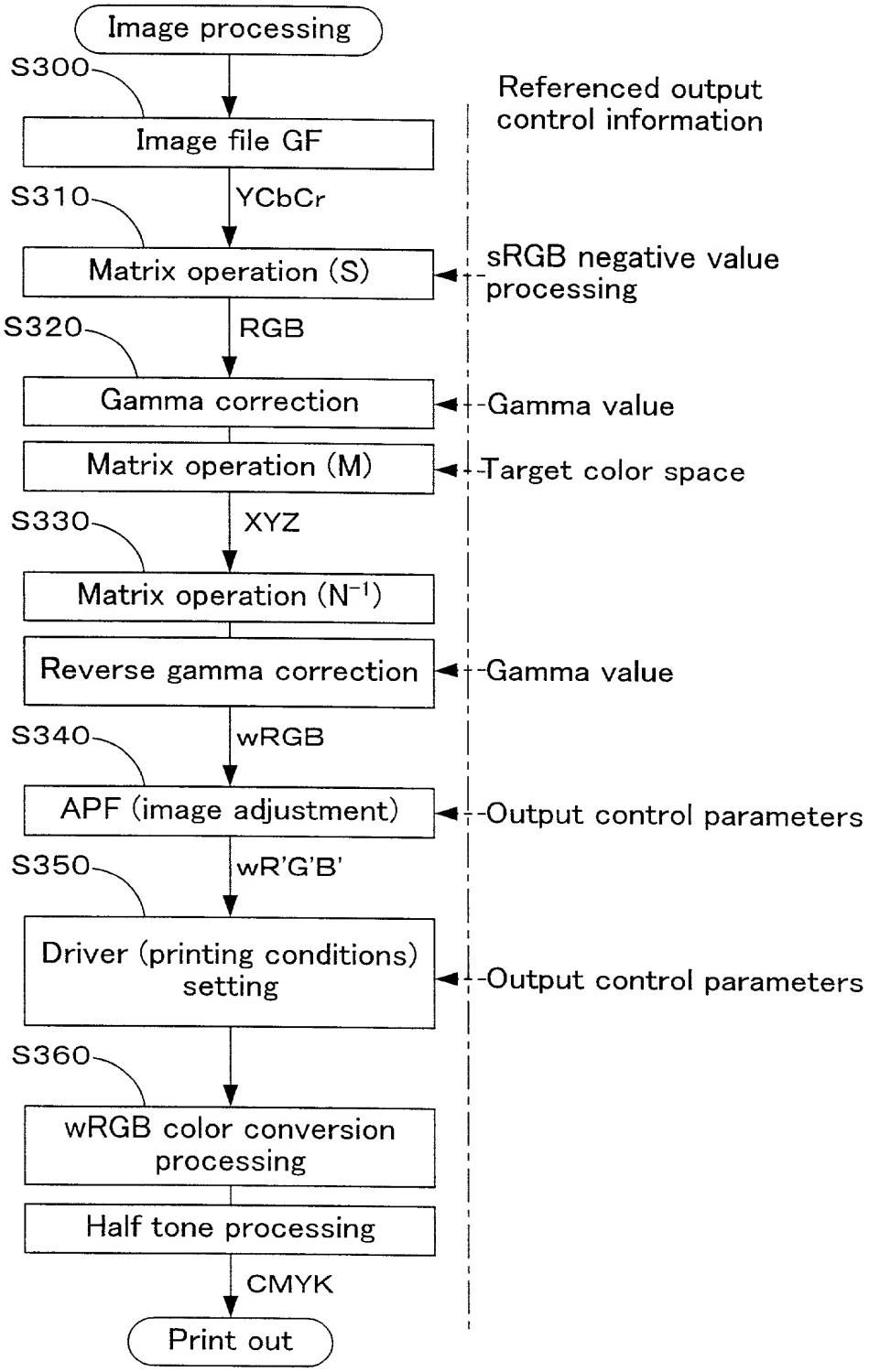
Image processing
S300
Image file GF
Referenced output control information
YCbCr
S310
Matrix operation (S)
sRGB negative value processing
RGB
S320
Gamma correction
Gamma value
Matrix operation (M)
Target color space
XYZ
S330
Matrix operation (N-1)
Reverse gamma correction
Gamma value
wRGB
S340
APF (image adjustment)
Output control parameters
wR'G'B'
S350
Driver (printing conditions) setting
Output control parameters
S360
wRGB color conversion processing
Half tone processing
CMYK
Print out

Fig.11

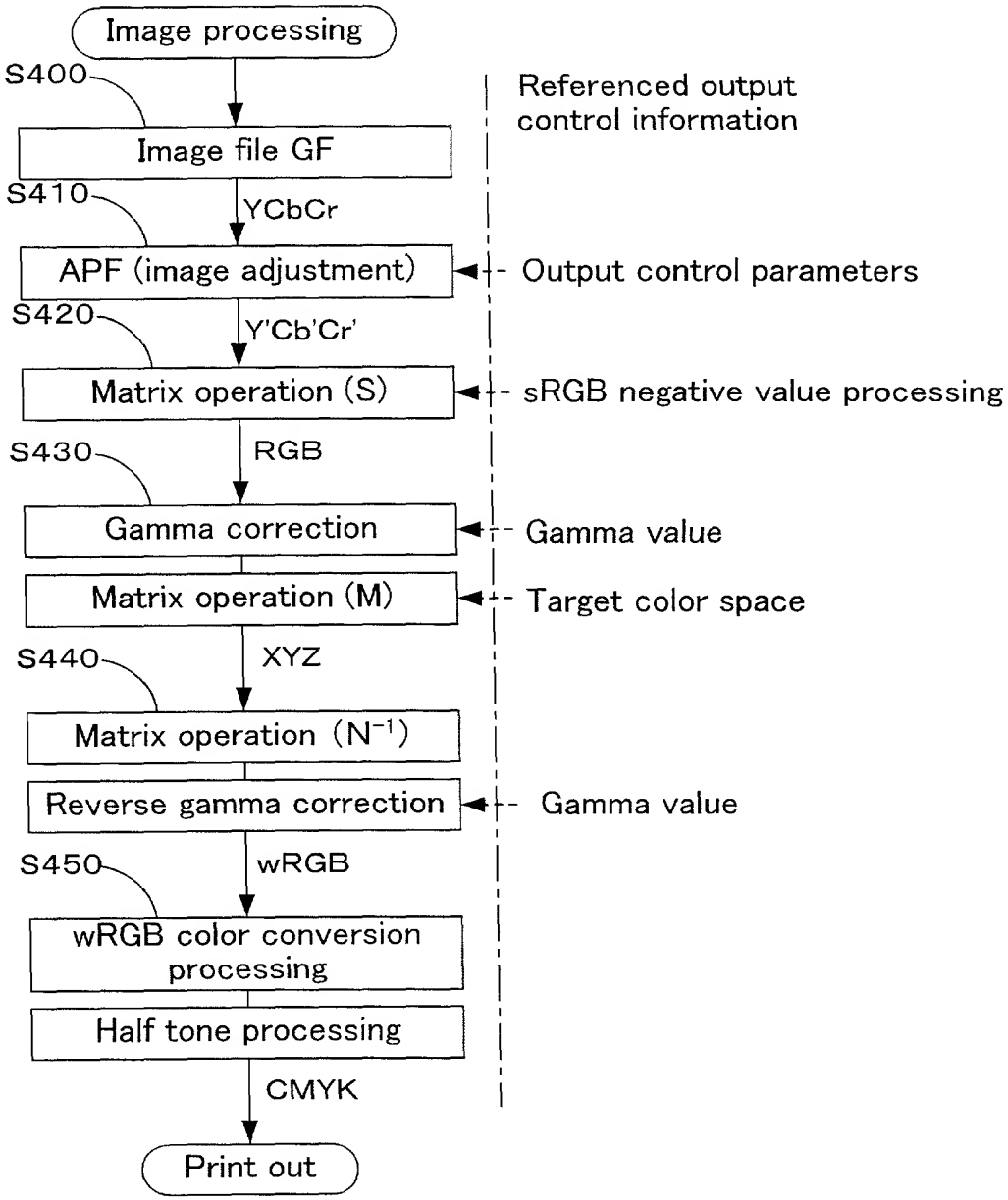
Image processing
S400
Image file GF
Referenced output control information
S410
YCbCr
APF (image adjustment)
Output control parameters
S420
Y'Cb'Cr'
Matrix operation (S)
sRGB negative value processing
S430
RGB
Gamma correction
Gamma value
Matrix operation (M)
Target color space
S440
XYZ
Matrix operation (N-1)
Reverse gamma correction
Gamma value
S450
wRGB
wRGB color conversion processing
Half tone processing
CMYK
Print out

$$\begin{pmatrix} R \\ G \\ B \end{pmatrix} = \mathrm{S} \begin{pmatrix} Y \\ Cb-128 \\ Cr-128 \end{pmatrix}$$

$$\mathrm{S} = \begin{pmatrix} 1 & 0 & 1.40200 \\ 1 & -0.34414 & -0.71414 \\ 1 & 1.77200 & 0 \end{pmatrix}$$

Figure 12

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \mathrm{M} \begin{pmatrix} Rt' \\ Gt' \\ Bt' \end{pmatrix} \qquad \mathrm{M} = \begin{pmatrix} 0.6067 & 0.1736 & 0.2001 \\ 0.2988 & 0.5868 & 0.1144 \\ 0 & 0.0661 & 1.1150 \end{pmatrix}$$

$Rt, Gt, Bt \geq 0$

$$Rt' = \left(\frac{Rt}{255}\right)^{\gamma} \qquad Gt' = \left(\frac{Gt}{255}\right)^{\gamma} \qquad Bt' = \left(\frac{Bt}{255}\right)^{\gamma}$$

$Rt, Gt, Bt < 0$

$$Rt' = -\left(\frac{-Rt}{255}\right)^{\gamma} \qquad Gt' = -\left(\frac{-Gt}{255}\right)^{\gamma} \qquad Bt' = -\left(\frac{-Bt}{255}\right)^{\gamma}$$

Figure 13

$$\begin{pmatrix} Re \\ Ge \\ Be \end{pmatrix} = \mathrm{N}^{-1} \begin{pmatrix} X \\ Y \\ Z \end{pmatrix}$$

$$\mathrm{N}^{-1} = \begin{pmatrix} 3.30572 & -1.77561 & 0.73649 \\ -1.04911 & 2.1694 & -1.4797 \\ 0.0658289 & -0.241078 & 1.24898 \end{pmatrix}$$

$$Re' = \left(\frac{Re}{255}\right)^{1/\gamma} \qquad G' = \left(\frac{Ge}{255}\right)^{1/\gamma} \qquad B' = \left(\frac{Be}{255}\right)^{1/\gamma}$$

Figure 14

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